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UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

NATIONAL SECURITY AND
INTERNATIONAL AFFAIRS DIVISION

B-208083

OCTOBER 19, 1983

The Honorable Caspar W. Weinberger
The Secretary of Defense

Attention: DOD Office of the Inspector General

Dear Mr. Secretary:

Subject: Development of Fire Support
Command and Control Systems
by the Army and the Marine Corps
(GAO/NSIAD-84-15)

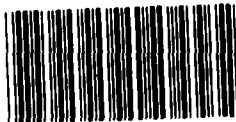
We reviewed the Army's and the Marine Corps' efforts to automate their fire support command and control functions. The two services are developing several systems to improve fire support mission effectiveness on the battlefield of the late 1980s and the 1990s. The significance of these systems lies both in their cost, which is estimated in the billions of dollars over their life cycles, and in their roles as command and control systems which help to manage substantial amounts of combat resources. During fiscal year 1984 about \$40 million is expected to be spent developing these fire support systems.

The potential for common fire support command and control systems in the Army and the Marine Corps has not been exploited in spite of the Department of Defense's (DOD's) policies promoting standardized systems and equipment. Although the missions are similar and the fire support systems need to communicate with each other, each service is developing its own systems. This has led to possible duplication of development efforts and interoperability problems.

BACKGROUND

The Army and the Marine Corps are developing a variety of fire support command and control automation equipment to satisfy the needs of the 1990's battlefield. These computer-based systems are intended to aid commanders by providing more accurate and timely information for use in employing cannon

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artillery, mortars, naval gunfire, and close air support. The Army has at least three systems in development to complement or replace two items now being fielded. The Marines started later than the Army but are now developing two systems, one to replace an aging system at the battery level and the other to provide new capability for the upper echelons.

Like most aspects of modern warfare, the fire support function has to respond to changing threats and rapid improvements in weapons technology. The commander's need for better and faster target data, available resources, and ballistics solutions has led to the development of automated systems to perform these tasks. These developments, some of which are already being used, consist of procedures, equipment, software, and communications devices at various command levels.

The Army's tactical fire direction system (TACFIRE) was the first of these systems and is now being fielded after more than 10 years of development. The system is supported by the battery computer system which performs firing data computations for individual guns. It too is currently being deployed.

The Army is also developing several systems to replace or complement existing equipment. The lightweight field artillery tactical data system is designed to replace, by 1986, selected TACFIRE equipment of the Army's highly mobile 9th High Technology Light Division. The advanced field artillery tactical data system is scheduled to replace TACFIRE throughout the Army sometime in the 1990s. Another development, the backup computer system, is a hand-held technical fire direction calculator intended as a backup to the battery computer system.

The Marine Corps has yet to field an automated fire support command and control system but has two in development. The Marine integrated fire and air support system (MIFASS) is a semi-automated system to help commanders control and coordinate supporting arms, including artillery, close air support, naval gunfire, and mortars. MIFASS is expected to begin deployment in 1987. The Marines are also developing an artillery computer system to provide technical firing calculations at the battery level. It will replace the outmoded field artillery digital automatic computer and is scheduled for deployment in 1986.

The following table shows fire support system equipment in use and in development by the two services for the various levels of their fire support organizations. It also includes terminals being developed to interact with these items.

Fire Support System Equipment Being Used
or Developed by the Army and Marine Corps

Army

Marine Corps

Corps through battalion

Division through Battalion

TACFIRE (F)
Light field artillery
tactical data system
for 9th Infantry Division
(D-1986)
Advanced field
artillery tactical data
system (D-1991)

MIFASS (D-1987)

Battery

Field artillery digital
automatic computer (U)
Battery display unit (F)
Battery computer system (F)
Backup computer system
(D-1985)

Field artillery digital
automatic computer (U)
Artillery computer system
(D-1986)

Terminals for various echelons

Variable format
message entry device (F)
Digital message device
(D-1987)

Digital communications
terminal (D-1984)

(U) - Currently in use
(F) - Partially fielded
(D) - In development--expected year of initial
operational capability

In the fire support functional area, the Marine Corps and the Army have some similar requirements, suggesting opportunities for common or joint systems. Similar weapons and doctrine, for example, have allowed the services to use the same ballistics computer and provide joint artillery training for their officers. Also, similar missions have required the Army and the Marine Corps to work side-by-side, especially in prolonged conflicts such as Vietnam. These close relationships have spawned the requirement that the services' fire support command and control systems be able to communicate with each other.

Mission differences exist also, and while these differences may constrain the degree of system commonality, they do not preclude it. Some of the differences are based on the amphibious mission defined by the Marine Corps. This mission involves coordinating all fire support assets--artillery, mortars, naval gunfire, and close air support--and thus requires a fire support system that goes beyond the scope of the artillery-based TACFIRE operated by the Army. Such variations are important, but they do not necessarily mean the services have to individually develop all unique hardware and software components.

POTENTIAL FOR COMMON
FIRE SUPPORT SYSTEMS
HAS NOT BEEN EXPLOITED

Even though DOD and the individual services have written numerous policies promoting standardized systems, efforts to pursue opportunities for common fire support systems in the services have proven unsuccessful. The Army and the Marine Corps are developing unique systems without fully analyzing the potential for commonality. This is in part the result of the services' perception that their requirements are unique and partly because of the lack of central direction by the Office of the Secretary of Defense (OSD) in pursuing a common system. Consequently, the services may be duplicating their development efforts and creating problems in achieving system interoperability.

DOD's interest in building common systems and equipment is a longstanding one, predicated on the life-cycle cost savings that can be achieved. Most recently, DOD's Acquisition

Improvement Program included an initiative (number 21) aimed at developing and using standard operation and support systems. A 1967 DOD Directive established policy for tactical command and control that seeks to minimize acquisition of equipment which has only limited or specialized application. At the service level, the Marine Corps has established an objective for its tactical command and control systems whereby commonality with systems of other services will be exploited where suitable components are available. The Marine Corps objective states "When standardization is effected, it is usually possible to reduce requirements for repair parts, test equipment, special tools, personnel, and training."

Little consideration, however, has been given to joint systems, as evidenced by the inadequate commonality studies and the resulting parallel developments. The Marine Corps, for example, is pursuing its own battery level computer after deciding not to buy the system now being fielded by the Army. Both services are developing their own systems for the higher command levels based in part on studies that were inconclusive or proven inaccurate.

In the case of a battery level system, the Marines' decision to withdraw from a joint program has prevented them from satisfying a longstanding requirement. Since the mid-1970s both services have recognized the need to replace their aging field artillery digital automatic computer. Although the Marine Corps initially joined the Army in developing the battery computer system, it dropped out of the project in 1979 because of escalating costs and began developing its own artillery computer system. The Army has since begun fielding the battery computer system, while the Marines have experienced development difficulties with their own program. As a result of these difficulties, the Marine Corps is again considering procurement of the Army's system to satisfy its requirement for a battery level system.

For the higher command levels, the services' experiences with TACFIRE, MIFASS, and the advanced field artillery tactical data system illustrate similar problems in developing a common system.

--In 1976 the Marine Corps studied the Army's TACFIRE, then in development, and concluded that its own system (MIFASS) would be less expensive and better able to satisfy the Marines' operational and size/weight requirements. As MIFASS development proceeds, however, the engineering model will cost more, weigh more, and have fewer capabilities than the MIFASS model envisioned when the contract was signed. In fact, increased size and weight of MIFASS led a Marine Corps study group to conclude the system is too big and heavy for battalion use. The Marines are now studying ways to reduce the battalion system by decreasing component redundancy planned for reliability.

--In 1981-82 a series of Army-contracted studies concluded that most MIFASS components would not be suitable for the advanced field artillery tactical data system program. While the studies--done in response to our recommendation--cited numerous differences between the two systems, several general conclusions were made on the basis that the advanced field artillery tactical data system had not been defined sufficiently to determine whether a significant degree of commonality could be achieved. The services' definition of requirements were accepted for the studies without question or explanation of potential for compromise to achieve commonality.

Causes for the inadequate attention to potential joint systems are twofold. First, each service perceives its needs as unique ones, unable to be satisfied by another's system. Second, OSD has not provided sufficient central direction to the services to ensure that potential for commonality is fully explored.

Several obstacles have been cited by the services as reasons why common fire support systems cannot be developed. Most of them involve mission differences and system preferences. The Marine Corps, for instance, believes its need to coordinate all supporting arms cannot be satisfied by the Army's field artillery system. The Army, on the other hand, has concluded that MIFASS is not responsive enough to support its troops in the "target-rich" European scenario. Neither service has explained why these differences require systems with totally unique hardware and software.

OSD, which has the responsibility to provide direction to the services, has not been organized or staffed to encourage common fire support command and control systems. We found that two different offices within the Office of the Under Secretary of Defense for Research and Engineering were responsible for monitoring the services' major systems, and that staff members in each office spent limited time keeping track of the systems. Responsibility for MIFASS was with the Deputy Under Secretary for Command, Control, Communications, and Intelligence; oversight for the advanced field artillery tactical data system was assigned to the Deputy Under Secretary for Tactical Warfare Programs. Given these circumstances, it is unlikely that opportunities to pursue a joint system could be fully explored.

The possible duplicate developments that could result from not pursuing common systems are most evident from what has happened in the Marine Corps. In building MIFASS and an artillery computer system, the Marines are experiencing some of the same development difficulties and cost overruns already encountered by the Army in its TACFIRE and battery computer system programs. For example, MIFASS was initially scheduled to be developed over 3 years at a cost of \$32 million. Development problems have since reduced MIFASS capabilities, increased the cost to \$91 million and extended the schedule to about 5 years. Fielding this unique system will also prevent the Marines from taking advantage of lower procurement and maintenance costs made possible by a standard Army/Marine Corps system.

Separate systems can add interoperability costs and problems as well. Both services recognize the need for their fire support systems to communicate with each other, and with separate systems this requires developing a software interface. The Marines' interface with the Army's TACFIRE, originally part of the MIFASS model, has since been deferred because of MIFASS funding problems and interoperability negotiations between the Army and allied countries. In 1981 the interface was estimated to cost \$5 million.

CONCLUSIONS

In developing their fire support command and control systems, neither the Army nor the Marine Corps has rigorously pursued opportunities for common systems. DOD has permitted

unique first generation systems for both services without thorough analysis of the potential for commonality. Each service has perceived its requirements as unique, and OSD has not acted strongly enough to get them together. As a result, no one can conclude that current system developments are the most effective in a joint environment and the most economical choices.

Achieving commonality in near term fire support command control automation is complicated by current Army and Marine Corps developments being out of synchronization, but the issue for the second generation systems can be addressed now while they are being conceived. Failure to explore this potential until later stages of development could mean further duplication of development efforts and continued interoperability problems.

Developing command and control systems has proven a difficult, costly task; the services should limit such developments to those that are absolutely necessary by combining efforts where feasible. Such combined efforts can prevent the services from repeating each other's costly development difficulties.

RECOMMENDATIONS

We recommend that the Secretary of Defense consolidate responsibility in OSD for fire support command and control systems to enhance central direction in pursuit of common and interoperable systems.

We also recommend that the Secretary of Defense assess, independently of the services, the potential for common fire support command and control systems in the Army and the Marine Corps. This assessment should quantify the costs and benefits of joint programs versus those of unique developments and identify the most cost-effective combination of systems. It should also consider how systems now being developed can be accommodated by a joint program.

VIEWS OF AGENCY OFFICIALS

OSD, Army, and Marine Corps officials with whom we discussed a draft of this report agreed that there could be opportunities for common fire support systems and that OSD has

not pursued the matter aggressively. Army and Marine Corps officials see these opportunities developing especially as concerns for battlefield interoperability grow and the Army pursues its new doctrine emphasizing light, highly mobile divisions and close coordination of all supporting arms. Officials from the two OSD offices responsible for fire support command and control systems believe the likelihood of developing common systems would be improved if responsibility for these systems were consolidated in one office. All officials were concerned, however, that commonality studies and a possible joint system development would further delay deploying systems now nearing the procurement phase.

We recognize the risks inherent in a joint program, but to continue developing unique systems could cost a great deal more in duplicate efforts and battlefield interoperability problems. Besides, the services could acquire interim fire support capabilities while they define requirements for a joint system over the longer term.

OBJECTIVES, SCOPE, AND METHODOLOGY

We undertook this review to evaluate the services' efforts at automating their fire support functions. Our objectives were to identify the Army's and the Marine Corps' strategies for acquiring fire support command and control systems, identify the extent of cross-service cooperation in their developments, and determine what improvements can be made to fire support automation efforts.

During our review, we discussed fire support automation and reviewed program documents at numerous organizations in the Army, Marine Corps, Navy, and DOD.

Our review was performed in accordance with generally accepted government auditing standards.

As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the House Committee on Government Operations

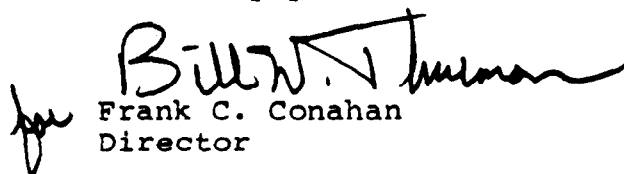
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and the Senate Committee on Governmental Affairs not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We would appreciate receiving a copy of your statement when it is provided to the congressional committees.

We are sending copies of this letter to the Director, Office of Management and Budget; the Secretaries of the Army and the Navy; and the Chairmen, Senate and House Committees on Armed Services and Appropriations.

Sincerely yours,


for Frank C. Conahan
Director